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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E.   **Semester: I / II**
Branch: Common to all Branches   **Duration: 3 hrs.**
Course Code: 18EE1ESELE / 18EE2ESELE   **Max Marks: 100**
Course: Elements of Electrical Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1. a) State and illustrate KVL and KCL with an example.   **06**

    b) Explain the speed versus armature current and torque versus armature current characteristics of a DC Shunt Motor.   **06**

    c) For the circuit shown in Figure 1 C, by applying superposition technique determine the current through the 15Ω resistor.   **08**
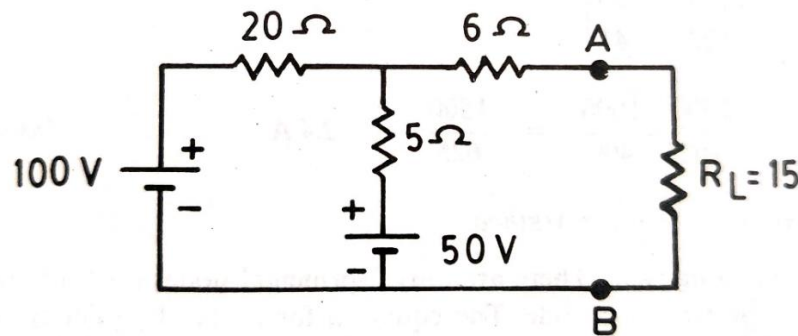

Figure 1c

OR

2. a) Derive an equation for the torque developed in the armature of a D.C motor.   **06**

    b) For the circuit shown in Figure 2 b, by applying KVL and KCL determine (i) the current in 15Ω resistor (ii) Voltage across 18Ω resistor and (iii) power dissipated in 7Ω resistor.   **07**
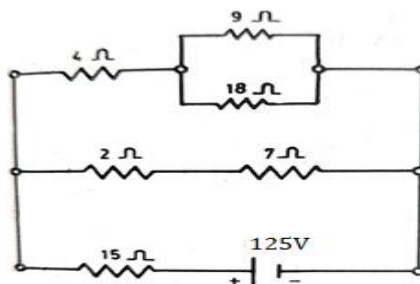

Figure 2 b

	c)	A DC series motor runs at 800 r.p.m when taking a current of 110A from a 230V supply. The resistance of the armature circuit is 0.12Ω and that of the series winding is 0.03Ω. The useful flux per pole for 110A is 0.024Wb and that for 60A is 0.0155Wb. Determine the speed when the current has fallen to 60A.	**07**

UNIT - II

3.	a)	With relevant waveforms and equations, show that in a pure inductive circuit current lags applied sinusoidal voltage by an angle of 90 degrees.	**08**
	b)	Define Average value of an alternating current. Arrive at an expression for Average Value of a sinusoidal current.	**06**
	c)	Write the expression for the current and determine power when voltage $v = 283\sin100\pi t$ is applied to a coil having $R = 50Ω$ and $L = 0.159H$.	**06**

UNIT - III

4.	a)	Show that the two wattmeters are sufficient to measure power in a balanced three-phase circuit. Also derive an expression for the power factor in terms of wattmeter readings**.**	**08**
	b)	A 3 phase, 400V motor takes an input of 40kW at 0.45 p. f lag. Determine the reading of each of the two wattmeters' connected to measure the input.	**06**
	c)	Compare salient pole and Non salient pole rotor types of an Alternator.	**06**

OR

5.	a)	A 6 pole, 3 phase, star connected alternator has an armature with 90 slots and 8 conductors per slot and rotates at 1000 r.p.m. The flux per pole is 0.05 Wb. Calculate the e.m.f generated if the winding factor is 0.97 and pitch factor is unity.	**08**
	b)	Derive the relationship between the line and phase currents and voltages for a balanced three phase star connected load.	**06**
	c)	Three 100Ω resistors are connected in (i) star and (ii) delta across a 415V, 50Hz, 3 phase supply. Determine the line and phase currents and the power consumed in each case.	**06**

UNIT - IV

6.	a)	A 10kVA, 400/200V,50Hz, single phase transformer has a full load copper loss of 200W and has a full load efficiency of 96% at 0.8 p. f lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity p.f?	**08**
	b)	Derive the E.M F equation of a single-phase transformer.	**06**
	c)	"In a transformer the iron loss is the constant loss and copper loss is variable loss''. Justify? How are they minimized?	**06**

UNIT - V

7. a) What is Earthing? Explain the method of Pipe earthing with neat diagram. **08**

    b) Explain the working principle of a three-phase induction motor. **06**

    c) A 10 pole induction motor is supplied by a 6 pole alternator, which is driven at 1200 r.p.m. If the motor runs with a slip of 3%, determine speed of the motor. **06**

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